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A Structural Equation Modeling Evaluation of the General Model of Instructional Communication

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The General Model of Instructional Communication introduced by McCroskey, Valencic, and Richmond (2004) is supported in its original conception by canonical data. This study, however, uses structural equation modeling (SEM) to provide a more detailed analysis. Although the model as originally hypothesized fits the data poorly, analysis of the SEM results suggests adjustments to the original model that substantially improve the model's fit. The revised model accounts for significant portions of the variance in the outcome variables, provides a more detailed explanation of the relationships involved, and has implications for future research. Bootstrapped parameter estimates suggest that the results are replicable.

Keywords: Big Three; General Model; Instructional Communication; SEM

McCroskey, Valencic, and Richmond (2004) proposed a General Model of Instructional Communication supported by the data gathered from 2,261 students of 93 different teachers. Their by-class analysis used canonical correlation to identify the relationships among teacher traits, teacher communication behaviors, student

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perceptions, and learning outcomes, supporting the hypothesized relationships: that teacher temperament is related to teacher communication behavior; that teacher temperament is related to student perceptions; that teacher verbal and nonverbal communication behaviors are related to student perceptions; and that teacher temperament, teacher communication behavior, and student perceptions are related to learning outcomes. Although McCroskey, Valencic, and Richmond's work identified a general set of relationships among types of variables, it was beyond the scope of their study to address relationships among the individual variables in each group or to attempt to provide evidence to support the causal links among those variables. This study attempts to advance this investigation. Unlike canonical correlation analyses, the structural equation modeling (SEM) techniques used in this study allow one to test the fit of the model to the data. Assuming the model has a strong theoretical basis, a model that fits the data well provides inferential support for the causal (temporal) assumptions of the model. Furthermore, SEM allows an examination of direct and indirect effects and, in this case, the examination of the relationships among individual variables within the model.

Review of the General Model of Instructional Communication

The general model advanced by McCroskey, Valencic, and Richmond (2004) is based on the rhetorical model of instructional communication (Mottet & Beebe, 2006) that suggests six essential components: teachers, teacher communication behaviors, students, student perceptions, instructional environment, and instructional outcomes. The proposed general model focuses on the four components most attributable to teachers (teachers, teacher communication behaviors, student perceptions, and instructional outcomes) and held two of the components (individual differences in students and the instructional environment) to be beyond the scope of the model, acknowledging that the variance in outcomes attributable to students and environment would be manifest in the overall error variance of the model. Analysis of canonical correlations among the variables selected to measure each component supported predictions that learning outcomes are influenced by teacher temperament, teacher communication behaviors, and student perceptions (or teacher credibility and task attraction); that student perceptions are influenced by teacher temperament and teacher communication behaviors; and that teacher communication behaviors are influenced by teacher temperament (see Figure 1).

Teacher Temperament

In McCroskey, Valencic, and Richmond's (2004) analysis, teacher temperament is represented by H. J. Eysenck's (1990) Big Three traits– psychoticism (P), extroversion (E), and neuroticism (N) – which, according to H. J. Eysenck (1986), "embody the three ways individuals can interact: hostility and aggression (P), cooperativeness and sociability (E), and fearful avoidance (N)" (p. 14). Of the "super-trait" models,

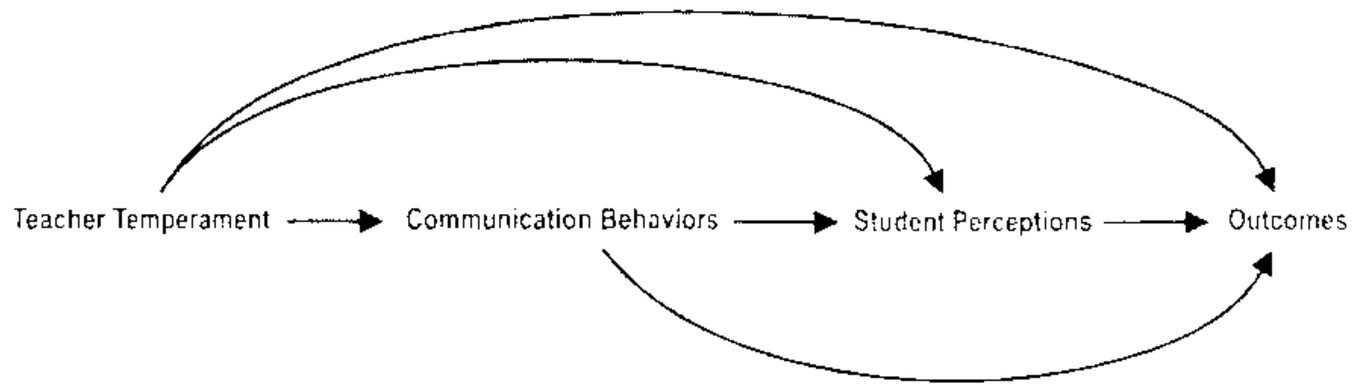

Figure 1 Relationships among components of the General Model of Instructional Communication (McCroskey, Valencic, & Richmond, 2004).

the Big Three is the most parsimonious and has been widely used in communibiological research (e.g., Beatty, McCroskey, & Valencic, 2001; Heisel, LaFrance, & Beatty, 2003; McCroskey, Heisel, & Richmond, 2001; Neuliep, Chadouir, & McCroskey, 2004).

Teacher Communication Behaviors

Teacher communication behaviors, as perceived by students, are represented by three variables: assertiveness, responsiveness, and nonverbal immediacy. The assertiveness and responsiveness constructs have their origin in the Social Styles model (also referred to as "socio-communicative style") originally researched by Merrill in 1966 (see Richmond & McCroskey, 1989) and more recently reported by Merrill and Reid (1999). Although the two constructs have an orthogonal relationship with one another, both are thought to be positively related to perceptions of teacher immediacy. Immediacy behaviors, as identified by Mehrabian (1971), "reduce physical or psychological distance and/or increase perceptual stimulation between and among interactants" (Gorham, 1988, p. 40). Teacher immediacy has repeatedly been shown to influence perceptions of teacher credibility (e.g., Johnson & Miller, 2002; Schrodt & Witt, 2006; Teven, 2001; Teven & Hanson, 2004; Thweatt & McCroskey, 1998) and student learning (Chesebro & McCroskey, 2001; Christophel, 1990; Christophel & Gorham, 1995; Frymier, 1994; Frymier & Shulman, 1995; Jaasma & Koper, 1999; Johnson & Miller, 2002).

Student Perceptions

The student perceptions element of the model is represented by the three dimensions of source credibility and task attraction. Source credibility, the modern extension of Aristotle's ethos, was for many years measured on two dimensions (competence and trustworthiness) until advanced factor analysis techniques allowed McCroskey and Teven (1999) to devise a reliable measure for the third dimension of ethos proffered by Aristotle: goodwill/caring. Studies indicate a relationship between teacher credibility and learning (e.g., Beatty & Zahn, 1990; Pogue & AhYun, 2006). Task attraction is one of the measures of interpersonal attraction (McCroskey & McCain, 1974).

Task attraction has been shown to be related to credibility and also to communicative style (e.g., Duran & Kelly, 1988; McCroskey, Hamilton, & Weiner, 1974; Weiss & Houser, 2007).

Outcomes

The outcomes element of the model considers cognitive learning, affective learning, and teacher evaluation. Cognitive learning is estimated by the learning-loss measure, which measures how much students thought they learned in the class of a given teacher against what they felt they could have learned with an ideal teacher (Richmond, Gorham, & McCroskey, 1987). This construct has been widely used in situations where it is necessary to compare reports of cognitive learning across disparate academic courses (e.g., Christophel, 1990; Comadena, Hunt, & Simonds, 2007; Frymier, 1994; Myers, 2002; Rodriquez, Plax, & Kearney, 1996; Witt & Wheeless, 2001). Affective learning is the process by which students develop positive affect toward the course material, measured by students' reports of affect for the topic and also by reports of their willingness to take similar courses in the future (McCroskey, 1994). Teacher evaluation is also based on students' affect – in this case, reports of attitudes about the teacher- and willingness to take courses from the same teacher in the future (McCroskey, 1994). Both affective learning and teacher evaluation have been widely utilized in communication research (e.g., Katt & Collins, 2007; Martinez-Egger & Powers, 2007; McCroskey, Richmond, Sallinen, Fayer, & Barraclough, 1995; Teven & McCroskey, 1996).

Potential Value of the Model

In sum, McCroskey, Valencic, and Richmond's (2004) initial general model offers a conceptualization of rhetorical communication that merges communibiological factors like H. J. Eysenck's (1990) Big Three traits with well-researched communication constructs like immediacy, credibility, and instructional outcomes. Although the model, as initially studied, does not include the communication environment or individual differences among the learners, it does define the general relationships between traits, behaviors, perceptions, and outcomes, providing a useful framework for the study of instructional communication variables. Schrodt, Turman, and Soliz (2006) cited the model as a theoretical frame in examining a subset (teacher behaviors, student perceptions, and instructional outcomes) of the model's components. Schrodt and Witt (2006) also cited it as part of the rationale for their study examining the relationship of instructor credibility to instructor immediacy and use of technology. Porter, Wrench, and Hoskinson (2007) used this model as a template for their examination of supervisor temperament and behavior on the perceptions and reported motivation and satisfaction of subordinates in an organizational context. The results reported in McCroskey, Valencic, and Richmond have also been cited by numerous other researchers (e.g., Chory, 2007; Glascock & Ruggiero, 2006;

McPherson & Liang, 2007; Mottet, Parker-Raley, Beebe, & Cunningham, 2007; Rosenfeld, Richman, Bowen, & Wynns, 2006).

Rationale for This Study

Although the canonical correlation analysis employed in the original study documents the overall relationships among the constructs, it is insufficient to reveal indirect relationships among the variables, to provide a specific analysis of the relationship of each individual variable to the others, or to specify the magnitude of each variable's contribution to the overall model. Advanced analysis utilizing SEM techniques can provide additional insight about the relationships among the variables in the General Model of Instructional Communication and the possible causal links therein. The purpose of this study is to reanalyze the same dataset used by McCroskey, Valencic, and Richmond (2004) using SEM techniques in an attempt to reveal more detailed information about the relationships between not just the categories of variables, but the individual variables identified in the model.

Hypothesized Model

H1: The specified model fits the data well.

This study uses SEM to provide deeper insight into the relationships in the General Model of Instructional Communication, and identifies areas where the model might be further refined. To that end, this study begins by testing the model portrayed in Figure 2, which is a strict structural interpretation of the model reported by McCroskey, Valencic, and Richmond (2004), where each variable has the potential to influence any variable that follows it. For this reason, all possible paths are identified in the hypothesized model—in this case, 63 paths. Therefore, although the initial hypothesis is that the fully specified model will fit the data well, there are, in effect, 63 hypotheses (each representing one potential relationship) that are tested simultaneously.

Method

As the purpose of this study is to provide a more detailed analysis of the relationships reported by McCroskey, Valencic, and Richmond (2004), the best way to ensure a valid differential analysis is to hold the data constant by reanalyzing the data from the original study. Hence, this study uses the same dataset that McCroskey, Valencic, and Richmond used previously. A brief description of the design, participants, and measures for the original study is included, followed by a more detailed description of the data analysis for this study (for a complete description of the methodological details of the original study, see McCroskey, Valencic, & Richmond, 2004).

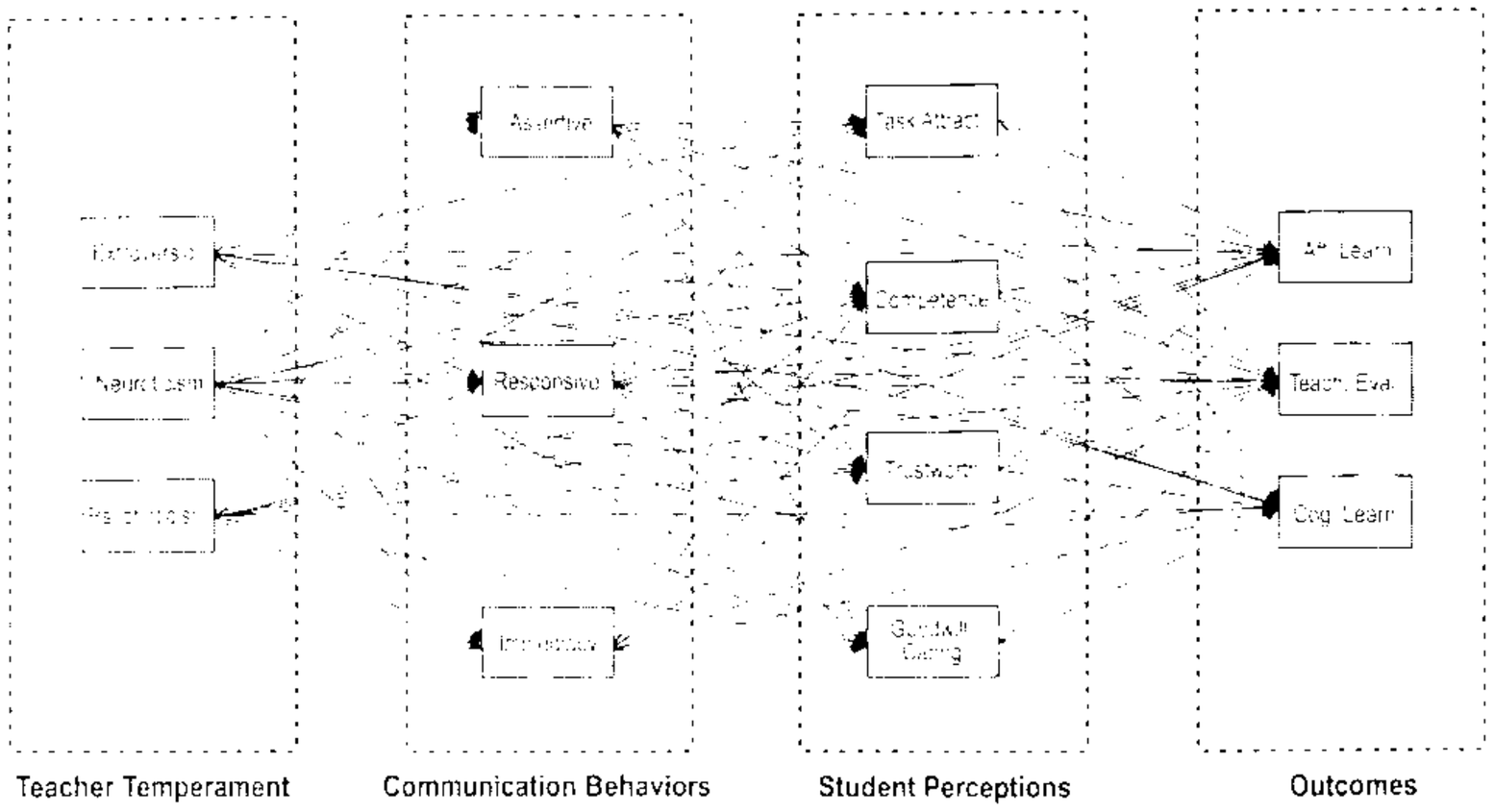

Figure 2 Hypothesized model. Note. χ^2 = 237.75; RMSEA = 0.452; ML = 0.29; LCFI = 0.6783; SRMR = 0.056.

Design

Data from self-reports of traits were gathered from teacher participants; and data from observations of behaviors, perceptions of credibility and task attraction, and reports of instructional outcomes were gathered from student participants. However, because the student observations were made in classroom settings with other students, data might have been partially confounded by a "halo effect," where the interactions among classmates affect their observations. To eliminate this possibility, a "by-class" design (a design commonly employed in educational research and first employed in communication research by Christophel, 1990) was used. The by-class design utilizes the means of each class as the unit of analysis —in this case, studying relationships between data gathered from the teachers (traits) and means of the data gathered from students in each class (behaviors, perceptions, and outcomes).

To reduce the chance of students developing a response set while completing the various measures, a split-class design was also employed, where students in each class were randomly assigned to one of two groups. Students in Group A responded to measures of observed teacher behaviors (assertiveness, responsiveness, and nonverbal immediacy), perceptions of teacher credibility, and task attractiveness, whereas students in Group B responded to measures of self-reported instructional outcomes (cognitive learning, affective learning, and teacher evaluation).

Participants

In all, the volunteer participants who provided usable data in the original study included 93 teachers and 2,261 students (1,123 in Group A and 1,138 in Group B),

and all were from a large, Mid-Atlantic university. Despite the large number of total participants, the by-class design limits the overall *n* for the study to 93 cases, which is the number of individual classes from which data were collected.

Measures

Temperament. The short-form, self-report measures for Extraversion, Neuroticism (H. J. Eysenck & Eysenck, 1985), and Psychoticism (S. B. G. Eysenck, Eysenck, & Barrett, 1985) were employed, with participants given three response choices for each of 10 Extraversion items, 10 Neuroticism items, and 11 Psychoticism items. Alpha reliabilities for the three scales were Extraversion = .76, Neuroticism = .83, and Psychoticism = .55. McCroskey, Valencic, and Richmond (2004) noted that the poor reliability of the Psychoticism measure might attenuate the measured effects of that variable.

Nonverbal immediacy. The 10-item, observer-report version of the revised teacher immediacy measure recommended by McCroskey et al. (1995) was used. Responses were gathered from students in Group A only. The alpha reliability was .81.

Socio-communicative style. The observer-report version of the Assertiveness–Responsiveness measure developed by Richmond and McCroskey (1990) consisting of two 10-item, seven-step, bipolar scales was administered to Group A participants. The alpha reliability was .84 for Assertiveness and .93 for Responsiveness.

Source credibility. Group A participants also completed McCroskey and Teven's (1999) three-dimension source credibility scales. Each dimension consists of six 7-step, bipolar scales. Alpha reliability estimates were Competence = .86, Caring/Goodwill = .92, and Trustworthiness = .88.

Task attractiveness. Group A participants responded to a six item, seven-step version of the Task Attraction dimension of McCroskey and McCain's (1974) interpersonal attraction measure. The alpha reliability was .77.

Affective learning. Affective learning was measured using eight bipolar, seven-step scales developed by McCroskey (1994). Only Group B participants responded to this measure. The alpha reliability was .92.

Cognitive learning. Cognitive learning was measured using the "learning-loss" method previously employed by Richmond, McCroskey, Kearney, and Plax (1987) and others. Only participants in Group B responded to these items. The learning-loss measure produces a single number with a negative valence (the lower the value, the higher the cognitive learning). For this study, to have all of the outcome variables oriented in the same direction, the data for learning loss were transformed so that higher values indicate higher reports of cognitive learning (please note that the original study left the data in its original direction). Although alpha reliability estimates are inapplicable to single-item measures, this measure has proven to be

effective in previous research (Chesebro & McCroskey, 2000; Richmond, McCroskey, et al., 1987).

Teacher evaluation. Group B participants also responded to a teacher evaluation measure consisting of eight bipolar, seven-step scales (McCroskey, 1994). The alpha reliability was .97.

Data analysis. In this study, SEM is used at the manifest variable level. Testing a latent variable model was precluded both by the effective sample size of 93 classes and the complexity of the model to be tested. The demand of the study's design (which in the end amounted to over 2,300 participants being assessed) limited the number of cases to be analyzed in this study. The complexity of the model to be tested, although sufficient at the manifest variable level, would have been under-identified if tested at the item level. Item parceling was not a consideration given the concerns reviewed in the literature (see Sivo, Saunders, Chang, & Jiang, 2006).

Given the sample size, it was an important consideration to evaluate the empirical power associated with the analytical results. MacCallum, Browne, and Sugawara (1996) provided an approach to assess power in SEM that was adopted in this study. Their procedure defines power in terms of the root mean square error of approximation (RMSEA) coefficient because it is one of the few fit indexes with a known distribution routinely reported in SEM program printouts, and so may be used easily by practitioners for calculating power. Using their approach, the power of this study was determined to be .83172. This suggests in this study that our sample size provides us an 83.2% chance of finding a difference that exists. By definition, power is the probability of rejecting a false null hypothesis. Treating the specified structural model as one collective hypothesis, power in SEM may be seen as rejecting a false null model, where power is computed as the probability that, under a noncentral chi-square distribution, the observed chi-square (χ^2_{obs}) is greater than the critical chi-square (χ^2_{crit}) at some alpha level (customarily, .05). Power may be determined once the noncentrality parameter (λ) is calculated via $Pr(\chi^2_{obs} > [\chi^2_{crit}, \chi^2_{df}, \lambda])$: the probability that the observed chi square is greater than the critical chi-square given the chi-square degrees of freedom and noncentrality parameter (λ).

Structural modeling and computation of indexes of fit were performed using both LISREL and SAS programs. For the assessment of the overall model, five fit indexes widely reported and supported in the literature are used: RMSEA, MacDonald's Centrality Index (Mc), comparative fit index (CFI), standardized root mean residual (SRMR), and chi square. Sivo, Fan, Witta, and Willse (2006) found that both the RMSEA and the Mc were superior to other indexes, such as the CFI and SRMR, in that as sample size increases, their values drop for incorrect models and increase for correct models. Furthermore, Fan and Sivo (2005; 2007) found that the RMSEA and the Mc perform well under various power conditions and that the previously reported sensitivity of the CFI and SRMR to different kinds of misspecification (manifest vs. structural) is not correct. The CFI, SRMR, and chi-square are, nevertheless, reported due to their historical presence in the literature.

Results

The maximum likelihood procedure converged properly for the hypothesized model as specified, but the chi-square goodness of fit was statistically significant: $\chi^2(12) = 237.75$. For this type of analysis, a significant chi-square is *not* desirable, as it indicates the relationships found in the data differed to a statistically significant degree from those predicted by the model. Moreover, the fit indexes suggest that the original model fit the data poorly (RMSEA = 0.4522, Mc = 0.2971, CFI = 0.6783, and SRMR = 0.1686). The data do not support the hypothesized model as originally specified. A careful review of the variables was undertaken to identify whether any of the relationships were notably problematic.

Theoretically Guided Adjustments to the Model

In deference to the underlying theory, when examining the model for possible adjustments, no modifications were considered that would change the temporal order of the model components (teacher traits, teacher communication behaviors, student perceptions, and learning outcomes). The possibilities for modifications within each component, however, were carefully examined. This flexibility is the chief advantage of using SEM instead of canonical analysis for the analysis of the data. Detailed analyses of the data suggested adjustments within each component of the original model.

In the teacher trait component, Neuroticism, which correlates only weakly with any of the other variables, was not contributing to the model. It was removed.

In the teacher communication behavior component, the data suggest a partially mediating relationship exists between assertiveness and responsiveness, as well as nonverbal immediacy. Merrill and Reid's (1999) explication of Social Styles presents assertiveness and responsiveness as core behaviors closely related to one's personality, and Richmond and McCroskey (1989) suggested socio-communicative style (assertiveness and responsiveness) might be predictive of immediacy behaviors. These findings support structuring a partially mediating relationship of assertiveness and responsiveness to immediacy (as opposed to immediacy mediating assertiveness and responsiveness). In assessing the face validity of this revised relationship, it is helpful to recall that the measures of teacher behavior were provided by the students (Group A) and, therefore, represent those students' perceptions of teacher behavior. Thus, the relationship of these data do not suggest certain behaviors might mediate other behaviors, but that one's perception of certain behaviors might influence one's perceptions of other behaviors. This is a partially mediating relationship inasmuch as Extroversion and Psychoticism still have a direct influence on nonverbal immediacy, in addition to the indirect, mediated relationship. The model was adjusted to allow assertiveness and responsiveness to influence immediacy.

In the student perception component, the data again suggest an interaction between the variables within the component, particularly a relationship between competence and the other variables in the component. The three ethos dimensions (competence, trustworthiness, and goodwill) have generally been studied as separate,

but parallel dimensions. A logical case can be made, however, that in an instructional setting the perception of a lack of competence might mitigate perceptions of the trustworthiness and goodwill. When teachers are perceived not to know what they're talking about, do students really care if those teachers are trustworthy and caring? Given this possibility, the model was adjusted to allow Competence to influence goodwill/caring, trustworthiness, and task attraction.

In the outcomes component, that data suggested variables within the component influence one another or, more precisely, the reports of various outcomes influence one another. In examining the three variables in this component, cognitive learning, affective learning, and teacher evaluation, it is helpful to recall how each is operationalized. Cognitive learning is a report of how much students feel they have learned compared to how much they could have learned with an ideal teacher. Affective learning is the students' report of positive affect toward the course material, and teacher evaluation is their report of positive affect toward the teacher. Inasmuch as students look to teachers to facilitate their learning, it would follow that perceptions of how much was learned might influence perceptions of affect for topic and teacher. Following this line of thinking, the model was adjusted to allow cognitive learning to influence teacher evaluation, which, in turn, influences affective learning. Although these learning outcomes, as the last strata of variables in the model, do not influence additional variables, the data suggest they influence one another and that each is affected by a different mix of the preceding behaviors and perceptions.

Finally, the data from the analysis of the hypothesized model indicated the direct paths from teacher traits to perceptions and outcomes were not contributing to the overall model. The canonical analysis employed by McCroskey, Valencic, and Richmond (2004) was limited to examining only direct relationships. However, although the variables are correlated, theorizing that students' perceptions and reported outcomes are directly affected by teacher traits, even in the absence of teacher behaviors, is logically problematic. Fortunately, the structural approach taken in this study allows for indirect effects to be identified, thus eliminating the need to pursue examination of these particular relationships. The direct paths from teacher traits to student perceptions and teacher traits to outcomes were removed.

Having made the adjustments described earlier, an analysis of the re-specified model was undertaken. The adjusted model produced a non-statistically significant chi-square – $\chi^2(20) = 19.5777$ –indicating the relationships found in the data do *not* differ to a statistically significant degree from those hypothesized by the revised model. Moreover, the fit indexes suggest that the revised model fit the data very well (RMSEA = 0.0000, Mc = 1.0000, CFI = 1.0000, and SRMR = 0.0444).

Then, in the interest of parsimony, and to avoid making inferences from unreliable data (see Sivo & Willson, 1998), paths that were not statistically significant and that did not substantially contribute to the fit of the model were eliminated one by one until the final model was derived. The final model (Figure 3) retained a nonsignificant chi-square, $\chi^2(39) = 40.6457$; and the fit indexes indicated an excellent fit (RMSEA = 0.0214, Mc = 0.9912, CFI = 0.9976, and SRMR = 0.0480).

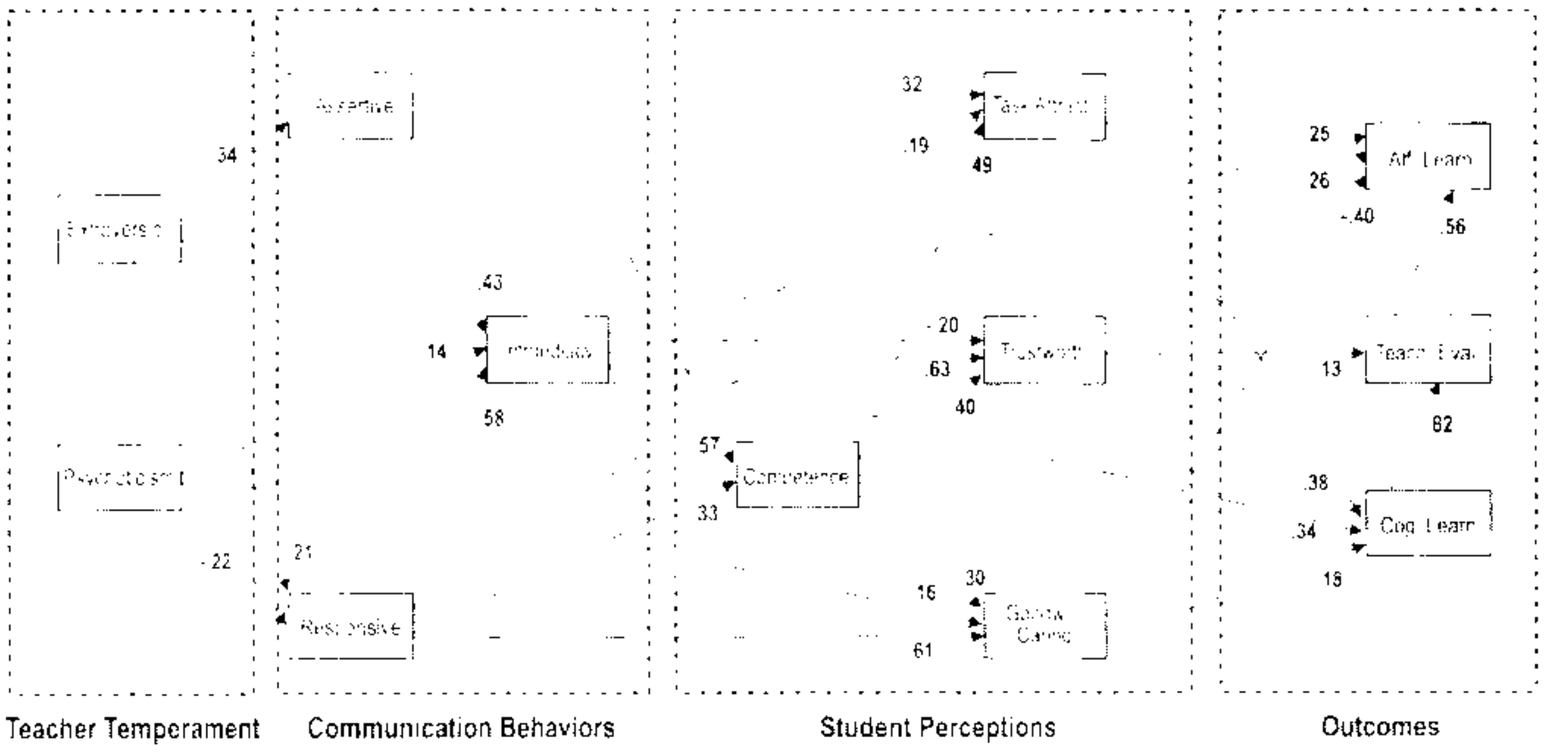

Figure 3 [illegible] Model. Net[illegible] .38 [illegible]8645 RMSEA 0.0214 Mc = 0.9912, CFI 0.990[illegible] SRMR 0.04850.

Contributions of Individual Measures

Tables 1 and 2 list all of the direct, indirect, and total effects of each variable on the two learning outcomes, cognitive and affective learning, respectively. Assertiveness and responsiveness, followed by task attraction and nonverbal immediacy, have the most effect on cognitive learning. Affective learning is affected most by perceptions of Cognitive learning and teacher evaluation, followed by assertiveness and nonverbal immediacy.

Explained Variance in Learning Outcomes

The final model accounts for 46% of the variance in affective learning and 58% of the variance in cognitive learning. It also accounts for 78% of the variance in teacher evaluation.

Table 1 Summary of Direct, Indirect, and Total Effects on Cognitive Learning

Variable	Direct	Indirect	Total
Extroversion	.00	.25	.25
Psychoticism	.00	.05	.05
Nonverbal immediacy	.34	.03	.37
Assertiveness	.00	.43	.43
Responsiveness	.00	.49	.49
Competence	.00	.24	.24
Trustworthiness	.00	.00	.00
Goodwill caring	.18	.00	.18
Task attraction	.38	.00	.38

Table 2 Summary of Direct, Indirect, and Total Effects on Affective Learning

Variable	Direct	Indirect	Total
Extroversion	.00	.16	.16
Psychoticism	.00	.01	.01
Nonverbal immediacy	.25	.09	.34
Assertiveness	.00	.36	.36
Responsiveness	.00	.18	.18
Competence	.25	.02	.27
Trustworthiness	.00	.08	.08
Goodwill caring	.40	.08	.32
Task attraction	.00	.17	.17
Cognitive learning	.00	.46	.46
Teacher evaluation	.56	.00	.56

Validation of Findings: Bootstrap Estimates

In instances where complete replication or cross-validation by splitting the sample are not feasible, bootstrap estimation is an appropriate validation technique (Schumacker & Lomax, 1996; Sivo, Saunders, et al., 2006). A bootstrap estimate of the covariance matrix was calculated from 200 samples of 93 cases (with replacement). The final model was reanalyzed using the bootstrap covariance matrix. Path estimates were calculated from the bootstrap model and confidence intervals were calculated. A review of Table 3 indicates that the estimated paths obtained for the final model are highly replicable as all of the estimated path coefficients fall within the confidence interval calculated from the bootstrapped estimates. Although this procedure cannot replace a true replication, the bootstrap estimates do suggest that the overall results are replicable (see Sivo, Saunders, et al., 2006).

Consideration of Measurement Error

Latent SEM allows researchers to correct estimated relationships in a covariance model for measurement error. Although manifest variable SEM also allows the testing of multiple equations at once, this procedure does not correct for measurement error. In this study, researchers opt for analysis on the manifest variable level because latent variable analysis is precluded by sample size limitations. Bollen (1989) and Stephenson and Holbert (2003) noted that manifest variable equations may be corrected for measurement error, to some degree, by including variable reliability information into the analysis, creating a latent composite (LC) model.

To test for possible misrepresentation of relationships as a result of unspecified error variance in this study, alpha reliability estimates for the relevant variables were used to derive estimates of error variance as described by Stephenson and Holbert (2003). The resulting LC model fit slightly better than the manifest variable model,

Table 3 Comparison of Bootstrap Estimate Parameters to Final Model Parameters

Path	Bootstrap parameter	Bootstrap *SE*	95% confidence interval		Final model parameter
Assertiveness → immediacy	0.330	0.054	0.224	0.136	0.330
Responsiveness → immediacy	0.330	0.042	0.248	0.412	0.330
Psychoticism → immediacy	0.230	0.130	0.025	0.485	0.240
Extroversion → assertiveness	0.520	0.150	0.226	0.814	0.440
Extroversion → responsiveness	0.450	0.210	0.038	0.862	0.440
Psychoticism → responsiveness	0.690	0.300	0.102	1.278	0.660
Assertiveness → competence	0.310	0.042	0.228	0.392	0.310
Responsiveness → competence	0.140	0.031	0.079	0.201	0.130
Immediacy → trustworthiness	0.120	0.054	0.014	0.226	0.120
Responsiveness → trustworthiness	0.210	0.029	0.153	0.267	0.210
Competence → trustworthiness	0.330	0.066	0.201	0.459	0.330
Assertiveness → task attraction	0.150	0.037	0.077	0.223	0.150
Responsiveness → task attraction	0.066	0.024	0.019	0.113	0.066
Competence → task attraction	0.420	0.074	0.275	0.565	0.420
Immediacy → affective learning	0.360	0.160	0.046	0.674	0.370
Competence → affective learning	0.520	0.210	0.108	0.932	0.510
Goodwill caring → affective learning	0.590	0.170	0.257	0.923	0.590
Teacher evaluation → affective learning	0.460	0.085	0.293	0.627	0.450
Immediacy → cognitive learning	0.068	0.019	0.031	0.105	0.070
Goodwill caring → cognitive learning	0.038	0.019	0.001	0.075	0.037
Task attraction → cognitive learning	0.120	0.027	0.067	0.173	0.120
Trustworthiness → teacher evaluation	0.410	0.160	0.096	0.724	0.410
Cognitive learning → teacher evaluation	7.220	0.490	6.260	8.180	7.230

retaining a nonsignificant chi-square, $\chi^2(391) = 36.227$, and an excellent fit (RMSEA = 0.0000, Mc = 1.0118, CFI = 1.000, and SRMR = 0.0504), suggesting the lack of error data in the manifest variable model did not contribute to misrepresentation of relationships. Moreover, Cronbach's reliabilities calculated for all scaled scores in advance of the SEM analysis closely approximated estimated values (see Table 4), affirming that the IC analysis correctly considered the estimated degree of measurement error.

It should be noted that this procedure does not take into consideration error related to the reliability of the exogenous variables, Extroversion and Psychoticism. Although the Extroversion scales (as reported earlier) produced a reasonable alpha reliability of .76, the Psychoticism scales produced a poor alpha reliability of .55. The poor reliability of this measure has been previously noted by other researchers (e.g., Cole, 2000; Heisel et al., 2003; McCroskey, Richmond, Heisel, & Hayhurst, 2004) and supports the suggestion (stated later) that future researchers consider using alternate trait measures. In any case, Neuroticism is only marginally influential

Table 4 Latent Composite Model: Comparison of Squared Multiple Correlations with Cronbach's Reliability

Variable		Error variance	Total variance	R^2	Cronbach's reliability
Measure	immediacy	0.1854	1.0364	0.8248	0.8149
Measure	assertiveness	0.1450	1.0019	0.8553	0.8550
Measure	responsiveness	0.0563	0.9987	0.9436	0.9437
Measure	competence	0.1430	1.0338	0.8617	0.8570
Measure	goodwill caring	0.0805	1.0398	0.9226	0.9195
Measure	trustworthiness	0.1726	1.0269	0.8278	0.8254
Measure	task attraction	0.2256	1.0491	0.7850	0.7744
Measure	affective learning	0.0756	1.0163	0.9256	0.9214
Measure	cognitive learning	0.3699	1.0390	0.6344	NA[a]
Measure	teacher evaluation	0.0321	1.0466	0.9693	0.9679
Factor	immediacy	0.2641	0.8713	0.6966	
Factor	assertiveness	0.2603	0.8569	0.6956	
Factor	responsiveness	0.8434	0.9424	0.1051	
Factor	competence	0.3547	0.8908	0.6018	
Factor	goodwill caring	0.0861	0.9593	0.9102	
Factor	trustworthiness	0.2405	0.9023	0.7335	
Factor	task attraction	0.1102	0.8233	0.8663	
Factor	affective learning	0.4489	0.9407	0.5228	
Factor	cognitive learning	NA	NA	NA	
Factor	teacher evaluation	0.1993	1.0143	0.8036	

[a] Cronbach's reliability is not applicable to single item measures.

in the final model; therefore, for this analysis, the ill effects of its lack of reliability are limited. (See the discussion of the efficacy of H. J. Eysenck's, 1990, Big Three in the following).

Discussion

The title of McCroskey, Valencic, and Richmond's (2004) article is "*Toward* [italics added] a General Model of Instructional Communication." This study takes *another* step "toward." The model is supported in its original conception by canonical data. This, more detailed, analysis using SEM fails to support the model as hypothesized but, after modification, the final model affirms the overall order of the components: that teacher temperament affects teacher behavior, that teacher behaviors affect student perceptions, and that student perceptions affect instructional outcomes. In addition, this study reveals internal relationships among the variables within each component and offers a clearer picture as a result of the elimination of non contributing paths. The revised model also accounts for substantial portions of the

variance in the outcome variables and provides a more detailed explanation of the relationships involved. Although additional research is needed to validate the findings, there are potential pedagogical implications of this study. Nonverbal immediacy has once again emerged as a key influencer of student perceptions of the teacher and the instructional outcomes achieved in the course, suggesting that if we could offer only one piece of advice for novice teachers, that advice should be "be immediate." The results also affirm assertiveness and responsiveness as factors that exert substantial influence on nonverbal immediacy, and student perceptions of teacher competence, teacher goodwill caring, and task attractiveness. Perhaps beyond looking at immediacy behaviors, teachers should be familiar with the factors that comprise assertiveness and responsiveness (see Richmond & McCroskey, 1990). Finally, teachers might also do well to learn to attend to those factors that influence their students' perceptions of competence (see McCroskey & Teven, 1999), as these results suggest a failure to be perceived as competent may taint students' perceptions of trustworthiness, goodwill, caring, and task attractiveness. As previously stated, however, additional research is needed to more thoroughly understand these pedagogical implications. Presently, the value of this study is primarily heuristic. As the General Model of Instructional Communication continues to be used as a theoretical frame, this study has several implications for future research.

Efficacy of H. J. Eysenck's Big Three for Research in Instructional Communication Settings

Based on this dataset, Neuroticism, one of H. J. Eysenck's (1990) "super traits," fails to explain any of the subsequent relationships that comprise the General Model of Instructional Communication. That fact, combined with the poor reliability of the Psychoticism measure, suggests that the Big Three may not offer the most useful representation of traits operative in instructional communication settings. McCroskey, Valencic, and Richmond (2004) suggested future research might examine alternative trait models such as Costa and McCrae's (1992) Big Five. Other communication scholars (e.g., Teven, 2007; Tidwell & Sias, 2005) have begun to look at this five-factor trait scheme. This analysis suggests a trait model other than the Big Three might provide a richer trait measure for the General Model of Instructional Communication as well. Perhaps a side-by-side comparison of the Big Three and Big Five measures, as they relate to instructional communication variables, would help determine the direction of future research.

The Relationship of Assertiveness and Responsiveness to Nonverbal Immediacy

The partially mediating effect of assertiveness and responsiveness on nonverbal immediacy also bears additional examination. Although the effects of nonverbal immediacy have been widely researched, little has been done to study the relationships between nonverbal immediacy and other behaviors, such as assertiveness and responsiveness. Before attempting another large-scale study, this partially mediating

relationship should be the subject of additional examination. Also, Merrill and Reid's (1999) original conceptualization of Social Styles (also know as socio-communicative style; see McCroskey & Richmond, 1996) included a third variable, *versatility*, which could be included in future research if a reliable instrument is developed.

The Relationship of Competence to Trustworthiness, Caring/Goodwill, and Task Attraction

Also of interest is the partially mediating effect of competence on the other source credibility dimensions. Although McCroskey and Teven (1999) found that competence, goodwill/caring, and trustworthiness vary independently, their findings do not rule out the possibility that perception of one dimension may influence the perceptions of the other dimensions. The authors suspect this relationship might be a function of the instructional context. Perhaps, from the students' perspective, the perception that a teacher is incompetent renders their perceptions of that teacher's trustworthiness and goodwill moot. A smaller scale study could investigate those relationships and provide a more detailed understanding. From a larger perspective, the results of this study indicate that variables in the same category influence one another. Future research that fails to consider the possibility of mediated relationships may run the risk of producing confounded results.

The Need to Control for Goodwill/Caring

The negative path between goodwill/caring and affective learning indicates a relationship in which goodwill/caring acts as a suppressor. Although goodwill/caring in isolation has a weak, but positive, correlation with affective learning, its relationship is stronger with predictor variables related to affective learning (immediacy and cognitive learning) than with affective learning directly. Thus, when the model is considered in its entirety, a negative path is created, as goodwill/caring, in effect, gets out of the way of the other, more predictive, variables. The presence of this suppressor effect suggests that future researchers investigating the effects of immediacy and cognitive learning on affective learning should consider controlling for goodwill/caring in their analyses.

The General Model of Instructional Communication (McCroskey, Valencic, & Richmond, 2004) examines instructional communication via a rhetorical (as opposed to relational) approach (see Mottet & Beebe, 2006) that assumes teachers are the primary source of information in the instructional exchange. Future research might alternatively examine instructional communication from a relational perspective. Also, the participants providing the dataset used in both studies are reporting their experience in traditional, face-to-face teaching contexts. With the increase of courses with online components and totally online courses, additional research is required to determine how the relationships outlined in the General Model of Instructional Communication are affected when the teacher is not physically present for portions (or all) of the instruction.

The use of learning loss, a self-report measure of cognitive learning, is a limitation of both this and the original studies. Although it would be ideal to measure comprehension and retention of course material, studies that seek to compare cognitive learning of students across courses and content areas are forced to rely on a more generalized indicator. Whereas such measures might be more accurately labeled "perceived cognitive learning," the learning-loss measure has provided a useful estimate of cognitive learning in a number of previous studies (e.g., Burroughs, 2007; Comadena et al., 2007; Richmond, Gorham, & McCroskey, 1987; Richmond, McCroskey, et al., 1987; Robinson, 1993).

In the original study, McCroskey, Valencic, and Richmond (2004) included a caveat about inferring causality from correlational analysis. Although this study also relies on correlational data and thus falls short of proving causality, the indexes of model fit provide additional evidence to support the presumed temporal order of the constructs and further suggests that the presumed causal relationships in this model are "worthy of testing for causality in future research" (McCroskey, Valencic, & Richmond, 2004, p. 208). In taking another step toward a General Model of Instructional Communication, we find there are more steps yet to take, including looking beyond H. J. Eysenck's (1990) Big Three to define teacher traits and carefully examining the ways that variables within each component of the model influence one another.

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